

MIDTERM #2#

COURSE NAME: MOBILE COMMUNICATION – (EE 463)

DATE: SMESTER 1, 2016-2017

TIME: 2 HOURS

IDEAL SOLUTION

Student's name:	Pin:	Student's signature	Total marks (18)

Important Notes:

- 1- TIME ALLOWED (2h)
- 2- THIS EXAMINATION PAPER HAS (4 PAGES), INCLUDING THE COVER PAGE.
- 3- TOTAL MARKS AVAILABLE (15)
- 4- MARKS AVAILABLE FOR EACH QUESTION ARE SHOWN IN THE EXAMINATION PAPER. ALL QUESTION ARE NOT OF EQUAL VALUE
- 5- ALL ANSWERS MUST BE WRITTEN IN INK. EXCEPT WHERE THEY ARE REQUIRED. PENCILS MAY BE USED ONLY FOR DRAWING, SKETCHING OR GRAPHICAL WORK.
- 6- THIS PAPER MAY NOT BE RETAINED BY THE CANDIDATE.
- 7- CLEARLY SHOW ALL STEPS AND FINAL ANSWER MUST MAKE SENSE.
- 8- READ EACH WORD CAREFULLY.

SPECIAL INSTRUCTIONS :

- 1- CANDIDATES MAY BRING TO THE EXAMINATION: CALCULATORS AND ALL NOTES THEY DEEM NECESSARY.
- 2- ANSWER ALL QUESTIONS.
- 3- YOU CAN USE THE REVERSE SIDE OF PAPERS ALSO.
- 4- ASSUME ANY MISSING VALUES.

Question	Multiple choice questions 6 marks)	Exercise1 : 6 marks	Exercise2 : 6 marks
Marks			

Question (1):-

1. In TDMA, interference happens if
 - a. Senders transmit data at the same time
 - b. Senders do not transmit data at the same time
 - c. Senders transmit data at the same frequency

Ans: a

2. In the _____ method, time is divided into intervals. In each interval, a reservation frame precedes the data frames sent in that interval.
 - a. token passing
 - b. reservation
 - c. polling
 - d. none of the above

Ans: a

3. Multiplexing can provide
 - a. Efficiency
 - b. Privacy
 - c. Anti-jamming
 - d. Both a and b

Ans: d

4. In TDM, the transmission rate of the multiplexed path is usually _____ the sum of the transmission rates of the signal sources.
 - a. Greater than
 - b. Lesser than
 - c. Equal to
 - d. Equal to or greater than

Ans: a

5. In Carrier Sense Multiple Access (CSMA), if station senses medium before trying to use it then chance of collision can be
 - a. Increased
 - b. Reduced
 - c. Highlighted
 - d. Decreased

Ans: b

6. Code Division Multiple Access (CDMA) differs from Time Division Multiple Access (TDMA) because there is no
 - a. bandwidth
 - b. link
 - c. carrier
 - d. timesharing

Ans: d

7. Standard GSM systems support a data rate of

- a. 9.6 kbps X
- b. 64 kbps
- c. 128 kbps

Ans: a

8. The state when dedicated signals are idle are called

- a. Death period
- b. Poison period
- c. Silent period
- d. None of the mentioned

An: c

9. Which multiple access technique is used by IEEE 802.11 standard for wireless LAN?

- a. CDMA
- b. CSMA/CA
- c. ALOHA
- d. none of the mentioned

Ans: b

10. The lower frequency bands are used for the uplink

- a. because of lower attenuation needed for power limited mobile users.
- b. because of more bandwidth and higher quality needed to transmit data and voice
- c. because of interferences between adjacent cells

Ans: a

11. Based on CDMA principles, several users can communicate

- a. Simultaneously but in different frequency carriers
- b. Within the same frequency carrier but at different time slots
- c. Simultaneously and in the same frequency carrier
- d. None of these

Ans: c

12. The maximum throughput for pure ALOHA is _____ per cent.

- a. 36.8
- b. 18.4
- c. 12.2
- d. none of the above

Ans: b

Exercise 1:

If GSM uses a frame structure where each frame consists of eight time slots, and each time slot contains 156.25 bits, and data is transmitted at 270.833 kbps in the channel.

1. Find
 - a. the time duration of a bit
 - b. the time duration of a slot
 - c. the time duration of a frame
 - d. How long must a user occupying a single time slot wait between two successive transmissions.
2. If This frame consists of six trailing bits, 8.25 guard bits, 26 training bits, and two traffic bursts of 58 bits of data, find the frame efficiency.

Solution

(a) The time duration of a bit, $T_b = \frac{1}{270.833 \text{ kbps}} = 3.692 \mu\text{s}$.

(b) The time duration of a slot, $T_{slot} = 156.25 \times T_b = 0.577 \text{ ms}$.

(c) The time duration of a frame, $T_f = 8 \times T_{slot} = 4.615 \text{ ms}$.

(d) A user has to wait 4.615 ms, the arrival time of a new frame, for its next transmission.

A time slot has $6 + 8.25 + 26 + 2(58) = 156.25$ bits.

A frame has $8 \times 156.25 = 1250$ bits/frame.

The number of overhead bits per frame is given by

$$b_{OH} = 8(6) + 8(8.25) + 8(26) = 322 \text{ bits}$$

Thus, the frame efficiency

$$\eta_f = \left[1 - \frac{322}{1250} \right] \times 100 = 74.24\%$$

Exercise 2

1.....

Step 1: If the medium is idle, transmit immediately

Step 2: If the medium is busy, wait a random amount of time and repeat Step 1

2.....

Step 1: If the medium is idle, transmit immediately

Step 2: If the medium is busy, continue to listen until medium becomes idle, and then transmit immediately

3.....

Step 1: If the medium is idle, transmit with probability p , and delay for worst case propagation delay for one packet with probability $(1-p)$

Step 2: If the medium is busy, continue to listen until medium becomes idle, then go to Step 1

Step 3: If transmission is delayed by one-time slot, continue with **Step 1**

- a. What kind of CSMA Protocols of 1 and 2 and 3.
- b. What is the consequence of each of them?

Solution

Nonpersistent CSMA Protocol:

Step 1: If the medium is idle, transmit immediately

Step 2: If the medium is busy, wait a random amount of time and repeat Step 1

Random backoff reduces probability of collisions

Waste idle time if the backoff time is too long

1-persistent CSMA Protocol:

Step 1: If the medium is idle, transmit immediately

Step 2: If the medium is busy, continue to listen until medium becomes idle, and then transmit immediately

There will always be a collision if two nodes want to retransmit (usually you stop transmission attempts after few tries)

p-persistent CSMA Protocol:

Step 1: If the medium is idle, transmit with probability p , and delay for worst case propagation delay for one packet with probability $(1-p)$

Step 2: If the medium is busy, continue to listen until medium becomes idle, then go to **Step 1**

Step 3: If transmission is delayed by one-time slot, continue with **Step 1**

A good tradeoff between Nonpersistent and 1-persistent CSMA